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Technical Memorandum

To: Craig Hartmann, Cliffs Erie
From: Kevin Menken and Rachel Walker, Barr Engineering
Subject: Wild Rice Literature Review and 2011 Field Survey for the Dunka Mining Area
Date: December 20, 2011
Project: 23/69-1241

Introduction

The Minnesota Pollution Control Agency (MPCA) sent an email to Cliffs Erie (Attachment A - dated March 16, 2011) requesting that a literature review and field survey be carried out with respect to the presence of wild rice (*Zizania palustris* L.) on water bodies identified as receiving waters downstream of the Dunka Mining Area. The following water bodies were listed in the MPCA email:

1) Unnamed Creek;
2) Billiken Creek;
3) Flamingo Creek;
4) Dunka River (downstream of SD001); and
5) Birch Lake (from Dunka River to Bob's Bay)

These water bodies (shown on Figure 1) make up the Study Area for the literature review and field survey described in this memorandum. The work was conducted by Barr on behalf of Cliffs Erie.

Wild Rice Literature Review

Barr reviewed publicly available documents containing information on the presence and absence of wild rice. Minnesota Department of Natural Resources (DNR) files and reports related to the Study Area waters are stored at the DNR offices in Tower, Minnesota. Other reports and resources (published by various agencies and organizations) that were reviewed for this evaluation were downloaded from digital or internet sources. Birch Lake was the only water body in the Study Area with a presence of wild rice documented in the literature. Information pertaining to wild rice in the Study Area that was obtained from the literature review is described below.

Literature Review Findings: DNR Lake/Stream Survey Files

Each DNR Fisheries Office maintains files on select surface waters within its management zone. All water bodies in the Study Area are within the management zone of the DNR office in Tower, Minnesota. The following is a summary of the documentation reviewed from each water body's file.

Unnamed Creek

Several files for waters named "Unnamed Creek" were observed, and one was close to or within the Study Area, based on Public Land Survey description. None of the files contained references to wild rice.

Billiken Creek

No files were located for Billiken Creek.

Flamingo Creek

No files were located for Flamingo Creek.

Dunka River

A file for Dunka River was located in the DNR Fisheries Office. The file contained a Lake Survey Summary, dated June 17, 1968. The aquatic vegetation of the lake was included in the summary; wild rice was not among the listed species.

Birch Lake

A file for Birch Lake was located in the DNR Fisheries Office, with numerous records dating back to 1954.

> Aquatic vegetation was documented in a 1954 Lake Survey Report, but no observations of wild rice were recorded. The 1954 report indicates a sulfate concentration of "0.0 p.p.m" and notes that "Birch Lake is a soft water lake of moderate fertility. It is low in phosphorus and suphates [sic] are lacking."
>
> The 1975 Lake Survey Report indicated that emergent vegetation covered less than one percent of the lake, in "scattered spots around the shoreline [in] shallow bays protected from wind action". Wild rice was observed during the 1975 survey and was given a

rating of "rare," although the report recorded "substantial wild rice beds in the lower part of Birch River." [Birch River flows into Birch Lake from the west].

In 1997, the DNR completed 50 vegetation transects along the Birch Lake shoreline. Of the 28 transects that contained vegetation, wild rice was listed as "rare" in nine, and "abundant" in two. Values for "maximum vegetation depth" range from one to four feet for those eleven transects. Shoalwater substrate information was also collected in 1997 and indicated that substrates around the lake were composed mostly of bedrock, boulders, and rubble. The only readily observable pattern was that the substrates of the two transects containing abundant wild rice had abundant muck. Field notes indicate that "wild rice continues to increase in abundance." A review of the field maps indicated that the rice occurred primarily in the farthest reaches of the bays.

The 2004, 2006, and 2009 Standard Lake Survey Reports do not record rice in the text of the report, but note that "Aquatic vegetation grows to a depth of 5 feet and is sparse, with small clusters in protected bays; water lilies, various pondweeds, and floating-leaf burreeds are the most common plants." Birch Lake ranks as mesotrophic-to-eutrophic according to Carson's Trophic State Index.

Literature Review Findings: Regional Resource Documents

Wild rice investigational reports with regional or statewide significance were also reviewed. Many of the documents reviewed did not contain any information about wild rice within the Study Area. Information pertaining to wild rice from the reviewed reports is included below. The following documents were reviewed:

Investigational Report #22. Moyle. 1941. *Report on Minnesota Wild Rice for 1940.* Bureau of Fisheries Research, Division of Game and Fish

None of the Study Area waters were listed in this report as a wild rice resource.

Investigational Report #40. Moyle. 1942. *The 1941 Minnesota Wild Rice Crop.* Bureau of Fisheries Research Division of Game and Fish

Birch Lake is listed as a wild rice resource, but no information is given on acreage, density, orother population and/or growth parameters.

2008 Natural Wild Rice in Minnesota Report – DNR

Birch Lake is listed as a wild rice resource, with an estimated wild rice coverage of 381 acres.

2009 Wild Rice Resource Guide (3rd Ed.) – 1854 Treaty Authority.

Of the Study Area waters, only Birch Lake was listed. It was noted as having easy access and a "good" potential for wild rice.

2010 Wild Rice Management Workgroup's "350 Significant Wild Rice Waters in Minnesota"

Of the Study Area waters, only Birch Lake was listed. It was noted as having easy access, low harvesting pressure, and good harvest potential.

2011 Wild Rice Field Survey

A field survey was conducted by Barr Engineering in August of 2011. No wild rice was found on the streams within the Study Area. Wild rice was identified at several locations on Birch Lake. Details of the wild rice field survey are below.

Field Survey Methodology

The purpose of the qualitative survey and water quality sampling was to document the presence or absence of wild rice and its relative stand density, as well as collect surface water samples (for sulfate analysis) in or near wild rice stands. The method used was similar to one used by the 1854 Treaty Authority, "Wild Rice Monitoring and Abundance in the 1854 Ceded Territory (1998 – 2008)" and other vegetation plot data surveys designed to quantify *in situ* plant species (e.g., *A Handbook for Collecting Vegetation Plot Data in Minnesota: The Relevé Method* (Minnesota Department of Natural Resources, 2007)).

Where wild rice was encountered, field crews recorded the GPS location, took photographs, and documented the location and a brief description of the wild rice stand. Dominant vegetation was noted along water bodies surveyed; Attachment B provides a list of common names for the scientific names

included in this memorandum. Surface water samples were collected at select locations where wild rice was observed. Water samples were sent to Pace Analytical Laboratory in Virginia, Minnesota and analyzed for sulfate).

A wild rice density rating, on a scale of 1 to 5, was applied to each observation of wild rice. The density rating is used to qualitatively assess the density of wild rice over a given area and relates to the approximate percent coverage of wild rice as listed in Table 1 and shown by example in the photos included in Attachment C. As discussed above, a similar method was used by the 1854 Treaty Authority. The 1854 Treaty Authority only surveyed known wild rice water bodies and did not include reconnaissance of small stream systems.

Table 1: Wild Rice Density Scale

Wild Rice Density Rating	Description
1	<10% Wild Rice Coverage
2	10 – 25 % Wild Rice Coverage
3	25 – 50 % Wild Rice Coverage
4	50 – 75% Wild Rice Coverage
5	>75% Wild Rice Coverage

For the 2011 field survey described in this memorandum, an initial evaluation of the Study Area water bodies was conducted by reviewing aerial photographs to identify access points and potential property issues. Aerial photographs were also used to get a preliminary understanding of stream conditions prior to the field visit, to corroborate what was seen in the field during the field visit, and to evaluate and document channel conditions along stream stretches that were not accessed by foot or kayak. The Birch Lake shoreline within the Study Area was surveyed by canoe. Where accessible, every stream section in the Study Area was surveyed by kayak or on foot. Some of the stream reaches were unnavigable by kayak or not accessed by foot due to the physical characteristics of the habitat. The habitat characteristics that limited physical access to certain stream sections included:

- Very low water levels (depths less than 1 foot)
- Predominantly rocky or sandy substrate

- Narrow channel conditions with little to no open water (often due to thick vegetation growth (*Typha* spp., *Phalaris arundinacea*, *Calamagrostis canadensis*, etc.) or channel morphology)
- Dense algal growth
- Dense overhanging vegetation
- The presence of forest species such as *Alnus* spp., *Fraxinus nigra, Betula* spp., *Picea mariana*, and *Populus tremuloides*

These habitat characteristics that limited physical access are also characteristics that limit the suitability of habitat for wild rice growth. Wild rice typically grows in open water with direct sunlight. Other conditions that favor wild rice growth include some flowing water (water bodies with an inlet and an outlet), water depths ranging from 1 to 4 feet, and predominantly mucky substrate. Stream reaches that were unnavigable by kayak or not accessed by foot were surveyed by consulting aerial photographs and by observing stream conditions from the nearest accessible points on the stream.

The field survey was conducted between August 15 and August 22, 2011. The method of survey and descriptions of each water body's channel characteristics are described below.

Wild Rice Survey Findings

After surveying approximately 7 miles of streams and 9 miles of shoreline within the Study Area, wild rice was found in two bays and along some shoreline of Birch Lake. Observations from the wild rice survey of each water body are described below and shown on Figures 2 and 3. Photographs of the Study Area are included as Attachment D.

Water Bodies Where Wild Rice Was Observed

Birch Lake – Surveyed 8/15/11 to 8/20/11

The southern shore of Birch Lake was reviewed using aerial photographs and was surveyed by canoe from Bob's Bay (Mile 23) to the bay at the outlet of Dunka River (Mile 33). Each occurrence of wild rice is listed in Table 2 and shown on Figure 3 (provided with a reference location (RL) label). Data collected at these locations include approximate stand dimensions, density rating, and the approximate number of plants (for one very small stand where an approximation was possible). Stands were generally located near the shoreline and in water approximately 1 to 3 feet deep. Stand sizes ranged from approximately

0.001 to 6.5 acres. *Potamogeton* spp. was identified growing in RL17 and RL18, comprising approximately 40% of the vegetation present in those stands. Other plant species growing near or within wild rice stands included *Sparganium* spp., *Calamogrostis canadensis, Scirpus* spp., *Tyhpa* spp., *Carex* spp. The shore was dominated by dense forest species.

Table 2: Wild Rice Stand Summary of Birch Lake

Wild Rice Observation Point	Wild Rice Stand Size (acres)	Wild Rice Stand Density
RL1	0.58	1
RL2	0.19	1
RL3	0.09	1
RL4	1.17	3
RL5	0.18	1
RL6	1.24	1
RL7	0.15	2
RL8	0.12	3
RL9	0.03	2
RL10	1.07	3
RL11	0.01	1, <20 stems
RL12	0.06	3
RL13	0.27	2
RL14	1.94	1
RL15	0.001	2
RL16	4.59	2
RL17	2.59	3
RL18	6.55	3

Sulfate concentrations in water samples collected from Birch Lake during the 2011 survey (Table3) ranged from 7.34 to 23.6 mg/L. Sulfate concentrations are listed on Figure 2 at the locations where samples were collected.

Table 3: Birch Lake Sulfate Concentrations

Sample ID	Wild Rice Observation Point	Date Collected	Sulfate Concentration (mg/L)
TM-BIR-KSW-01	RL4	8/15/11	19.4
TM-BIR-RMK-04	RL17	8/17/11	21.0
TM-BIR-RMK-05	RL18	8/17/11	23.6
TM-BIR-JDS-05	RL12	8/18/11	7.34

Water Bodies Where Wild Rice Was Not Observed

Billiken Creek – Surveyed 8/22/11

No wild rice was observed. Billiken Creek was surveyed from Mile 0.0 to its confluence with Unnamed Creek. As discussed in the Methodology section, all creek sections were initially reviewed by consulting aerial photographs. Multiple beaver dams and large wetland complexes were present in portions of the creek reach. Water levels appeared low at the time of the survey, based on water marks lining rocks and channel vegetation. No areas of suitable wild rice habitat were identified in this creek.

Mile 0.0 to Mile 0.25 was surveyed while walking (and dragging the kayak) in the creek channel or alongside the channel. The channel was initially dominated by a dense stand of *Typha* spp. and then transitioned to an open area with a wet, exposed, mucky substrate. Little or no surface water was present in the *Typha* spp. stand. There was up to 6 inches of water in the creek channel in the open area. Channel vegetation was initially dominated by *Typha* spp. and transitioned to a mix of *Typha* spp., *Carex* spp. and *Calamogrostis canadensis*.

Mile 0.25 to Mile 0.42 was surveyed by kayak through open water ponded behind a large beaver dam. The creek channel in this area was submerged and the width of the beaver pond was approximately 300 feet, with a water depth up to approximately 4 feet. There was no vegetation in the open water area. Along the shoreline, there was either an exposed mucky substrate or rocky ledges and boulders. Vegetation was sparse along the shoreline, with some scattered *Carex* spp. present.

Mile 0.42 to Mile 0.68 was surveyed by walking (and dragging the kayak) in the creek channel or alongside the creek channel and small ponds. There were small ponds of open water at the beginning and end of this reach, with water depths up to 2 feet. These ponds were generally too shallow to navigate with

a kayak. Between these ponds the stream channel was located within dense stands of either *Typha* spp., *Calamogrostis canadensis* or *Almus* spp. The transition area between these dense stands was generally a mix of *Typha* spp., *Carex* spp. and *Calamogrostis canadensis*. The soil was saturated but little or no surface water was present, except in the two small ponded areas.

Mile 0.68 to the confluence with Unnamed Creek at Mile 0.76 was surveyed by kayak. The channel was submerged by water that was ponded behind a large beaver dam located on Unnamed Creek downstream of the confluence. Water depths in this area were 3 to 4 feet. Dead *Almus* spp., *Picea mariana* and *Larix laricina* were found throughout this reach, with *Lemna* spp. found on the water surface along the shoreline. The shoreline was either exposed mucky substrate or rocks, with scattered *Carex* spp. present.

Unnamed Creek – Surveyed 8/22/11

No wild rice was observed. Unnamed Creek was surveyed from Mile 0.0 to its outlet at Bob's Bay. As discussed in the Methodology section, all creek sections were initially reviewed by consulting aerial photographs. Multiple intact beaver dams and large wetland complexes were present along most of the creek reach. No areas of suitable wild rice habitat were identified in this creek.

Mile 0.0 to 0.2 was surveyed by kayak in open water ponded behind a large beaver dam . The creek channel in this area was submerged and the width of the beaver pond was approximately 350 feet. The water depth ranged from 2 to 6 feet. Dead coniferous trees were present in the water, within 50 feet of the shoreline. The shoreline was dominated by either dense stands of *Typha* spp. or a mix of *Typha* spp. and *Calamogrostis canadensis*.

Mile 0.2 to 0.7 was surveyed by walking along the beaver dam at Mile 0.2, by visual observations while standing on a ridge overlooking the creek at Mile 0.25, and by visual observations at Mile 0.7. At Mile 0.2, the channel was not readily visible because it was located within a wetland complex dominated by a dense stand of *Typha* spp. and *Calamogrostis canadensis*, with scattered mature *Larix laricina* and *Picea mariana* trees also present. This wetland complex had soft mucky substrates with 4 to 6 inches of water visible at the surface. The ground was too soft to safely walk through the wetland and there was not enough open water to kayak. Therefore, observations were conducted on a ridge that overlooked the wetland complex at Mile 0.25. The creek channel was not visible and the wetland was completely

covered with herbaceous vegetation and scattered small coniferous trees, with mature coniferous forest observed at the wetland edge. No open water was visible.

Mile 0.7 to 1.0 was accessed by kayaking from Billiken Creek to the beaver dam at Mile 1.0 on Unnamed Creek, and then walking upstream along the edge of a wetland complex. The creek channel is located within a large wetland complex from Mile 0.7 to Mile 0.9 that was characterized by dense stands of *Calamogrostis canadensis, Scirpus cyperinus* and *Sparganium* spp. in the center, with *Alnus* spp., *Larix laricina and Picea mariana* at the edges. The channel was not visible. The soil in this area was saturated, but no surface water was observed. From Mile 0.9 to 1.0 there was a small open water area ponded behind a beaver dam. Scattered *Sparganium* spp. was observed in the ponded area, with dense stands of *Calamogrostis canadensis, Scirpus cyperinus* and *Sparganium* spp. found outside of the ponded area.

Mile 1.0 to 1.4 was surveyed by kayaking through open water and dragging the kayaks over multiple beaver dams. Water ponded behind the beaver dams was 2 to 5 feet deep. The ponds were up to 200 feet in width. Dead *Alnus* spp.was found throughout these ponded areas with scattered dead *Picea mariana* and *Larix laricina* also observed. In some areas, the surface of the water was either covered with 1 to 3 inches of Lemna spp. or the water was covered by dense mats of aquatic vegetation. The shoreline of the ponded areas was generally rocky. Vegetation along the shoreline included *Calamogrostis canadensis*, *Alnus* spp., and conifers, which shaded the edge of the water.

Mile 1.4 to Mile 1.7 was surveyed by walking (and dragging the kayaks). The creek narrowed at Mile 1.4 to a width of 2 to 3 feet, with meanders that were too sharp to navigate in a kayak. The channel was entrenched up to 6 feet and located within a wide wetland complex. The water depth ranged from 1 to 3 feet. The water surface was covered by *Lemna* spp. in some areas. The wetland was characterized by hummocks and dominated by *Calamogrostis canadensis* with *Alnus* spp., *Picea mariana* and *Larix laricina* also present. Vegetation in the creek channel included *Scirpus* spp. and *Sparganium* spp. The water in the channel was generally shaded by the overhanging vegetation.

Mile 1.7 to Bob's Bay was reviewed by visual observations from the road at Mile 1.7, kayaking on Bob's Bay to the mouth of Unnamed Creek, and using aerial photographs. At Mile 1.7, the channel entered into a dense *Alnus* spp. and *Picea mariana* wetland with no visible surface water. This wetland also had a closed canopy, which is not conducive for the growth of wild rice (which typically grows in open water

with direct sunlight). Visual observations were conducted at the mouth of Unnamed Creek by kayaking through Bob's Bay. At the mouth, the channel was obstructed by downed trees and woody debris. As at Mile 1.7, there was a dense canopy shading the channel that included *Alnus* spp. and mature coniferous trees. Aerial photographs were used to confirm that a dense canopy was present from Mile 1.7 to Bob's Bay.

Flamingo Creek – Surveyed 8/22/11

No wild rice was observed. Flamingo Creek was surveyed from Mile 0.0 to its outlet in Bob's Bay. As discussed in the Methodology section, all creek sections were initially reviewed by consulting aerial photographs. No areas of suitable wild rice habitat were identified in this creek.

Mile 0.0 to 0.3 was analyzed by visual observation from an overlook above Mile 0.0 and an overlook at Mile 0.3. There is no defined creek channel or observed surface water flow in this reach. The creek is located within a 200-foot wide wetland complex from Mile 0.00 to Mile 0.25, with small shallow, open water areas. The wetland is dominated by a dense stand of *Typha* spp. with some areas of *Alnus* spp. The dominant tree species along the edge of the wetland included *Populus tremuloides* and other deciduous trees.

Mile 0.3 to Mile 0.4 was surveyed while walking in the creek channel or alongside the channel. The channel was located within a wetland complex that was up to 280 feet wide. The creek channel was located within a large wetland complex that was characterized by dense stands of *Calamogrostis canadensis, Scirpus* spp. and *Sparganium* spp. in the center, with *Alnus* spp., *Larix laricina and Picea mariana* at the edges. The surface water in the wetland was approximately 6 to 12 inches deep. At Mile 4.0 there was a small pond surrounded by *Typha* spp., with floating mats of aquatic vegetation covering nearly 75 percent of the pond.

Mile 0.4 to 0.53 was surveyed while walking in the creek channel or alongside the channel. The creek narrowed at Mile 0.4 to a width of 1 to 2 feet and the water depth was approximately 6 inches. The channel was entrenched up to 2 feet, with a mucky substrate. The creek channel was located within a forested wetland area that was 50 to 100 feet wide. The vegetation shading the creek channel included *Alnus* spp., mature deciduous trees and *Calamogrostis canadensis*. On both sides of the road that crosses this reach at about Mile 0.51, there were small open water areas that were shaded by *Alnus* spp. Beyond

the pond on the west side of the road, the creek channel was located within a wetland dominated by *Alnus* spp. The creek channel was dry and completely shaded by the vegetation.

Mile 0.53 to Mile 0.75 was surveyed while walking in the creek channel or alongside the channel. The creek channel transitioned from the *Alnus* spp.-dominated wetland into a dense stand of *Typha* spp, and then into a dense stand of *Scirpus cyperinus*. The water in the creek channel in the *Typha* spp. area was 3 to 6 inches deep. Just downstream of the *Scirpus cyperinus* area, the creek channel continued into a small ponded area located behind a beaver dam. The pond had a mucky substrate and the water depth was approximately 1 to 2 feet. Vegetation around the edge of the pond included *Scirpus cyperinus*, *Typha* spp., *Sparganium* spp. and *Calamogrostis canadensis*. Downstream of the beaver dam, the creek channel was not well defined, making it difficult to determine where the channel was located in the forested area. While there was not a well-defined channel, the topography and aerial photographs indicated the creek continued to the northeast into a forested area. The forested area had a dense canopy which is not conducive for the growth of wild rice (which typically grows in open water with direct sunlight).

Mile 0.75 to Bob's Bay was analyzed by visual observations at Mile 0.75, by kayaking on Bob's Bay to the mouth of Flamingo Creek, and using aerial photographs. At Mile 0.75, the creek entered into a dense forest with no defined channel and no visible surface water. Visual observations were conducted at the mouth of Flamingo Creek by kayaking across Bob's Bay. There was not an obvious creek channel along the shoreline where the aerial photographs indicated the mouth was located. Along the shoreline, there was a dense canopy shading the channel that included *Alnus* spp. and mature coniferous trees. Aerial photographs were used to confirm that a dense canopy was present from Mile 0.75 to Bob's Bay.

Dunka River – Surveyed 8/20/11

No wild rice was observed. As discussed in the Methodology section, all creek sections were initially reviewed by consulting aerial photographs. Surveying began at SD001, near Mile 0.5.

Mile 0.5 to approximately Mile 0.8 was surveyed by kayak. At Mile 0.5, the river channel passes through two large culverts. East of the culverts, the stream channel ranged from 30 to 40 feet in width. At approximately Mile 0.55, a trail crossed the channel where the substrate was comprised of shifting, fine sand and the stream was 4 to 6 inches deep. Signs of ATV traffic were present in the area and included tracks in the stream channel and trails on the shoreline. West of the trail crossing, the river channel was 2

to 5 feet deep with a mucky substrate. Vegetation along the channel included *Alnus* spp., *Chamaedaphne calyculata* and *Populus tremuloides*. The banks of the river generally had boulders on the shoreline with vegetation overhanging the river. Vegetation observed in the shallow water along the banks included *Sparganium* spp. and *Calamogrostis canadensis*.

The stream reaches from Mile 0.8 to approximately Mile 2.3 and Mile 2.4 to the outlet at Dunka Bay were not surveyed by kayak or foot. Based on review of aerial photographs and past surveys conducted on foot along this reach (surveyed in 2009), these channel stretches were comprised of continuous rocky and sandy substrate, several sets of rapids, dense overhanging vegetation along the shore, and water depths ranging from 4 to 6 inches. No areas of suitable wild rice habitat were identified in these stream reaches in previous surveys or on aerial photographs.

Mile 2.3 to 2.4 was accessed via a transmission line corridor and surveyed by foot. The width of the river along this reach ranged from 20 to 120 feet. Water depths ranged from approximately 6 inches to 4 feet. Dominant vegetation included *Fraxinus nigra*, *Alnus* spp., and *Chamaedaphne calyculata*.

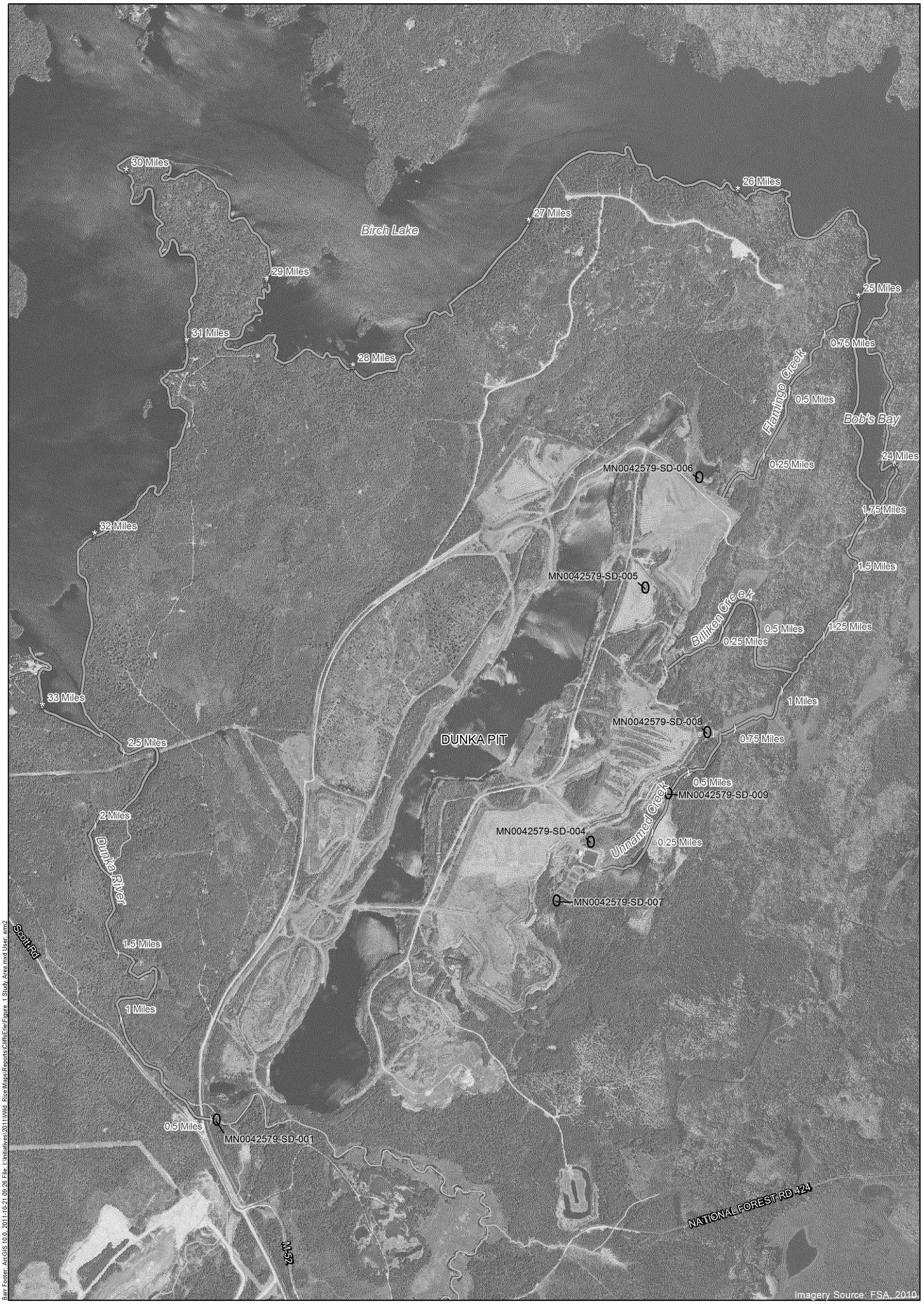
Wild Rice Survey Summary

The wild rice survey for Cliffs Erie consisted of evaluating approximately 7 miles of stream and 9 miles of Birch Lake shoreline (Figure 1), as identified by the MPCA, to document the presence or absence of wild rice in the water bodies. The fieldwork was completed between August 15 and August 22, 2011. Birch Lake was surveyed by canoe, and the streams were surveyed either by foot, by kayak, or by examination of aerial photographs combined with visual observations from the nearest accessible locations.

Wild rice was found with density ratings between 1 and 3 (on a scale of 1 to 5) in Birch Lake (Figures 2 and 3).

Wild rice was not identified along the 7 miles of streams. Channel conditions in the streams, including sections with very low water levels, a narrow stream channel, the presence of overhanging dense vegetation and the presence of forest species such as *Alnus* spp., were generally not conducive to the growth of wild rice. These conditions also made portions of the streams difficult to navigate by kayak or on foot.

Figures



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NPDES Water Quality Monitoring Station for Cliffs Erie

\# Mile Markers - Birch Lake

" Mile Markers - Rivers & Streams

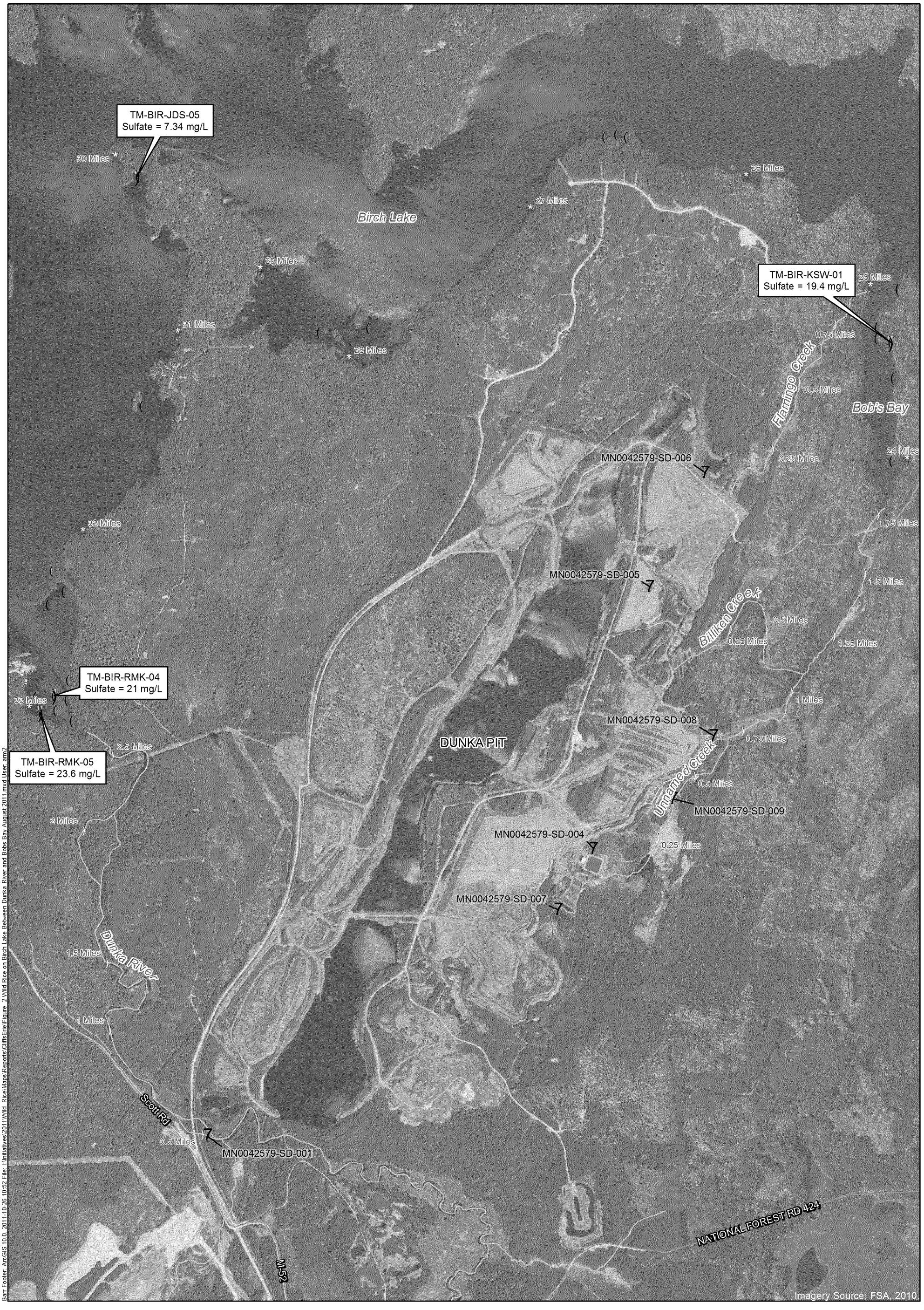
Stream and Shoreline Segments Surveyed in 2011

Other Rivers & Streams

0 800 1,600 3,200

Feet

Figure 1
2011 WILD RICE STUDY AREA
Cliffs Erie - Dunka
St. Louis County, MN



Wild Rice Density

- 1 <10% Wild Rice Coverage
- 2 10-25% Wild Rice Coverage
- 3 25-50% Wild Rice Coverage
- 4 50-75% Wild Rice Coverage
- 5 >75% Wild Rice Coverage
- Mile Markers - Birch Lake
- Mile Markers - Rivers & Streams

NPDES Water Quality Monitoring Station for Cliffs Erie

Water Sampling Locations

Rivers & Streams

0 800 1,600 3,200

Feet

Figure 2
WILD RICE OBSERVED IN STUDY AREA
AUGUST 2011
Cliffs Erie - Dunka
St. Louis County, MN

Barr Footer: ArcGIS 10.0, 2011-10-26 10:52 File: I:\Initiatives\2011\Wild Rice\Maps\Reports\CliffsErie\Figure 2 Wild Rice on Birch Lake Between Dunka River and Bobs Bay August 2011.mxd User: arm2

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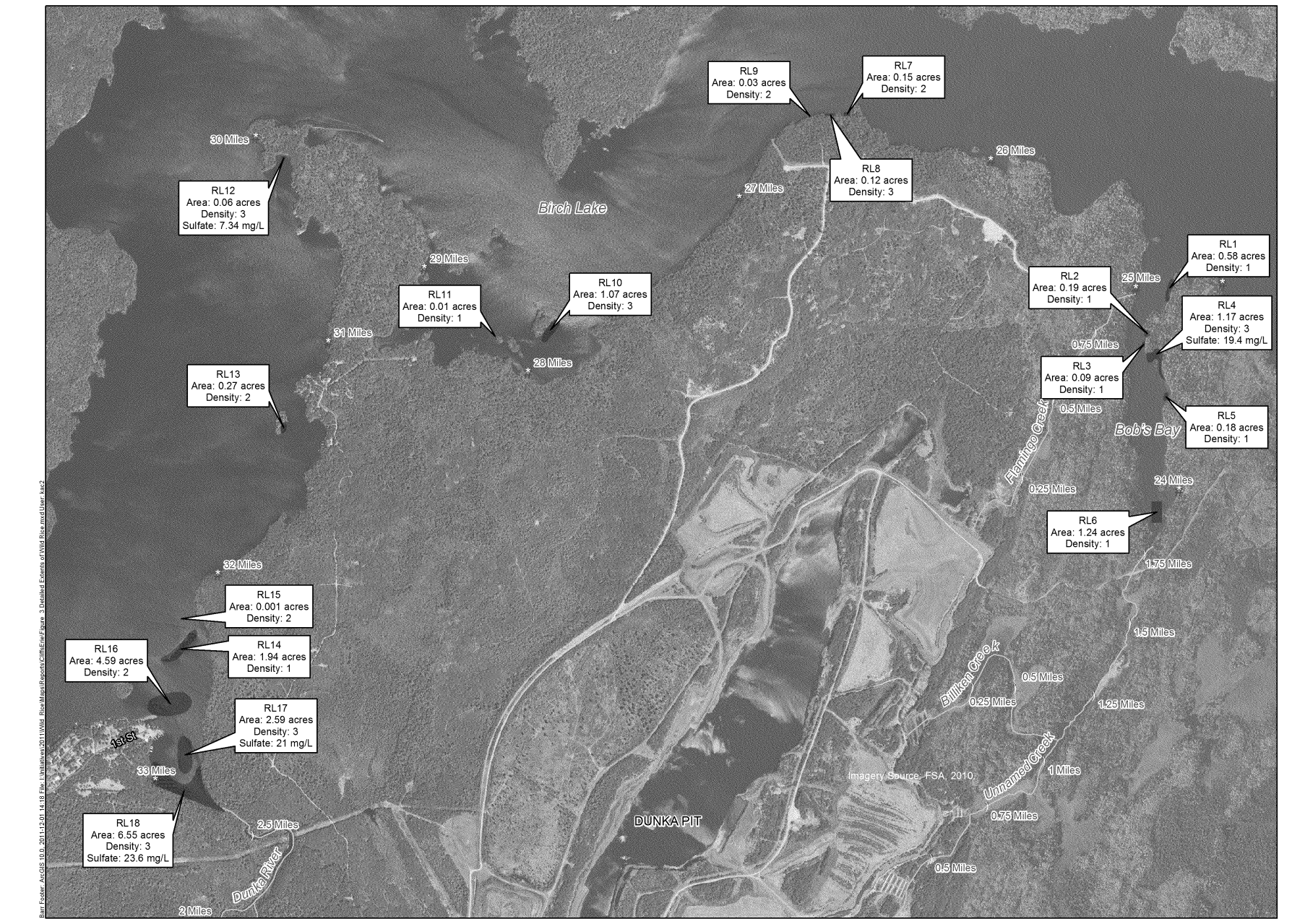


Figure 3
DETAILED EXTENTS OF
WILD RICE - AUGUST 2011
Cliffs Erie - Dunka
St. Louis County, MN

Attachment A

MPCA Email to Cliffs Erie (March 16, 2011)

Attachment A - MPCA Email to Cliffs Erie

Hartmann, Craig

From: Handeland, Stephanie (MPCA) [Stephanie.Handeland@state.mn.us]
Sent: Wednesday, March 16, 2011 8:30 AM
To: Hartmann, Craig
Cc: Clark, Richard (MPCA); Foss, Ann (MPCA); Thomas, John (MPCA)
Subject: Request for Information on Wild Rice - Dunka Mining Area (MN0042579)

March 16, 2011

Craig Hartmann, Area Manager
Cliffs Natural Resources
County Road 666 – PO Box 900
Hoyt Lakes, MN 55750

RE: NPDES/SDS Permit No. MN0042579
Cliffs Erie – Dunka Mining Area
Request for Information on Wild Rice

Dear Mr. Hartmann:

The Minnesota Pollution Control Agency (MPCA) is in the process of reissuing the NPDES/SDS permit for the Cliffs Erie – Dunka Mining Area. One of the goals of the MPCA is to protect surface waters used for the production of wild rice. Over the last several months, MPCA staff has been working to develop guidance to help determine, on a case-by-case basis, what waters of the state are "used for the production of wild rice" and subject to the 10 mg/L sulfate standard under Minn. R. 7050.0224, Subp. 2. The discharges from the Dunka site may have impacts to potential wild rice waters downstream of the discharges.

Due to the elevated levels of sulfates in the mine pit dewatering and in the constructed wetland treatment system discharges, the MPCA is requesting the company to conduct a search for wild rice downstream of its discharge points and to gather additional information regarding wild rice downstream of its permitted discharge points. This information will be important for the permitting process to ensure that appropriate water quality standards are applied and to ensure that surface waters, including those used for the production of wild rice, are adequately protected.

We are requesting the company to survey the following receiving waters downstream of the Dunka mining area discharges for the presence of wild rice:

- Unnamed Creek
- Billiken Creek
- Flamingo Creek
- Dunka River (downstream of the SD001 discharge)
- Birch Lake (to the nearest proximity of and/or downstream of the mouths of Dunka River and Unnamed Creek, and in particular including Bob Bay)

The company should provide the following information to the MPCA:

1. A literature search for wild rice in the downstream receiving waters listed above potentially impacted by the discharges. Some data sources that may be used to determine the potential for wild rice impacts include Appendix A of the 2008 DNR Wild Rice Report, the most recent DNR Wild Rice Harvester Survey, and the 1854 Treaty Authority List. For waters listed in the DNR Wild Rice Report, Gary Drotts at 218-833-8620 and Ann Geisen at 218-833-8625 may be contacted to gather all the available Department of Natural Resources (DNR) data on those sites. Information on any active or proposed DNR management activities designed to establish, protect, or enhance the

wild rice resources of these waters would be helpful.

2. A field survey to observe whether wild rice is actually present in all waters potentially impacted by the discharges that were determined to have potential for wild rice, either based on the literature search above or those that have characteristics which may encourage wild rice production. When the field survey is conducted, it should be conducted by a qualified professional and should take into account the cyclic nature of the growth of this aquatic plant.

3. The results of water quality monitoring for sulfate in the waters potentially impacted by the discharges in which wild rice is found to be present. The company should attempt to collect at least one grab sample in each water where wild rice is found to be present.

The wild rice literature search and field survey work should be conducted in 2011. The company may incorporate results from previous wild rice survey work that may have been done in the recent past as part of its submittal.

We appreciate your cooperation in this matter. If you have any questions regarding this request, please contact me at 651-757-2405 or by e-mail at stephanie.handeland@state.mn.us.

Sincerely,

Stephanie Handeland
Industrial Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155
Voice (651) 757-2405 Fax (651) 296-8717
stephanie.handeland@state.mn.us

Attachment B

Scientific and Common Names of Emergent Macrophytes

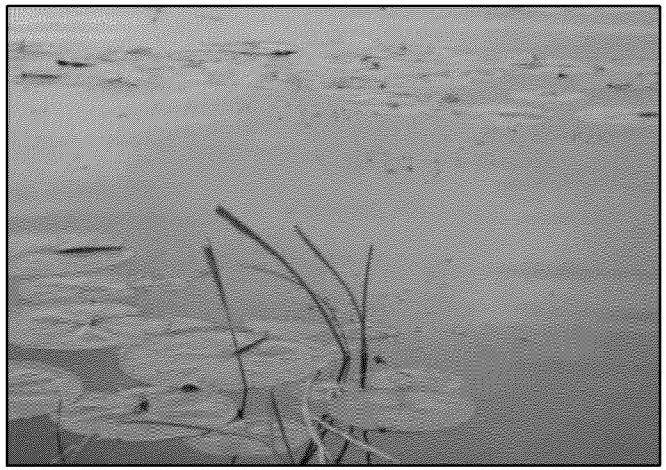
Attachment B
Vegetation Summary
Wild Rice Survey Report
Cliffs Erie, LLC

Scientific Name	Common Name
Alnus spp.	Alder
Betula spp.	Birch
Calamagrostis canadensis	Canada bluejoint
Carex spp.	Sedge
Thuja occidentalis	Northern whitecedar
Chamaedaphne calyculata	Leatherleaf
Fraxinis nigra	Black ash
Larix laricina	Tamarack
Lemna spp.	Duckweed
Picea mariana	Black spruce
Populus tremuloides	Quaking aspen
Potamogeton spp.	Pondweed
Scirpus cyperinus	Woolgrass
Scirpus spp.	Bulrush
Sparganium spp.	Burreed
Sagitarria graminea	Grassy arrowhead
Typha angustifolia	Cattail, narrow-leaved
Typha latifolia	Cattail, broad-leaved

Attachment C

Photographs Depicting Range of Wild Rice Densities

Density Level 1



Density Level 2

Density Level 3

Density Level 4

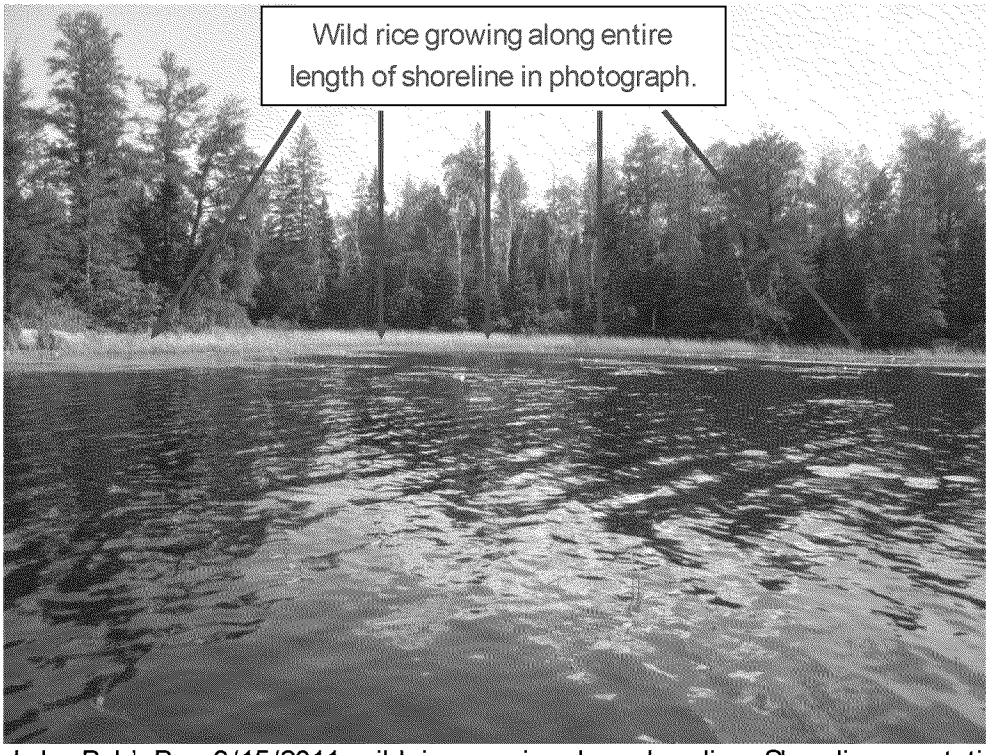
Density Level 5

Attachment C

Photographs Depicting Range of Wild Rice Densities (1-5)

Attachment D

Photographs of Study Area



Birch Lake, Bob's Bay, 8/15/2011, wild rice growing along shoreline. Shoreline vegetation is predominantly wild rice. Photo taken at reference location RL4.

Birch Lake, Bob's Bay, 8/15/2011, wild rice and lily pads. Emergent vegetation is predominantly wild rice. Photo taken at reference location RL4.

Birch Lake, 8/17/2011, wild rice near Dunka River outlet, facing north. Vegetation in photograph is predominantly wild rice. Photo taken at reference location RL18.

Birch Lake, 8/17/2011, wild rice near Dunka River outlet, facing east. Vegetation in photograph is predominantly wild rice. Photo taken at reference location RL18.

Billiken Creek, 8/22/2011, looking northeast towards Mile 0.25 – no wild rice

Billiken Creek, 8/22/2011, near Mile 0.5 – no wild rice

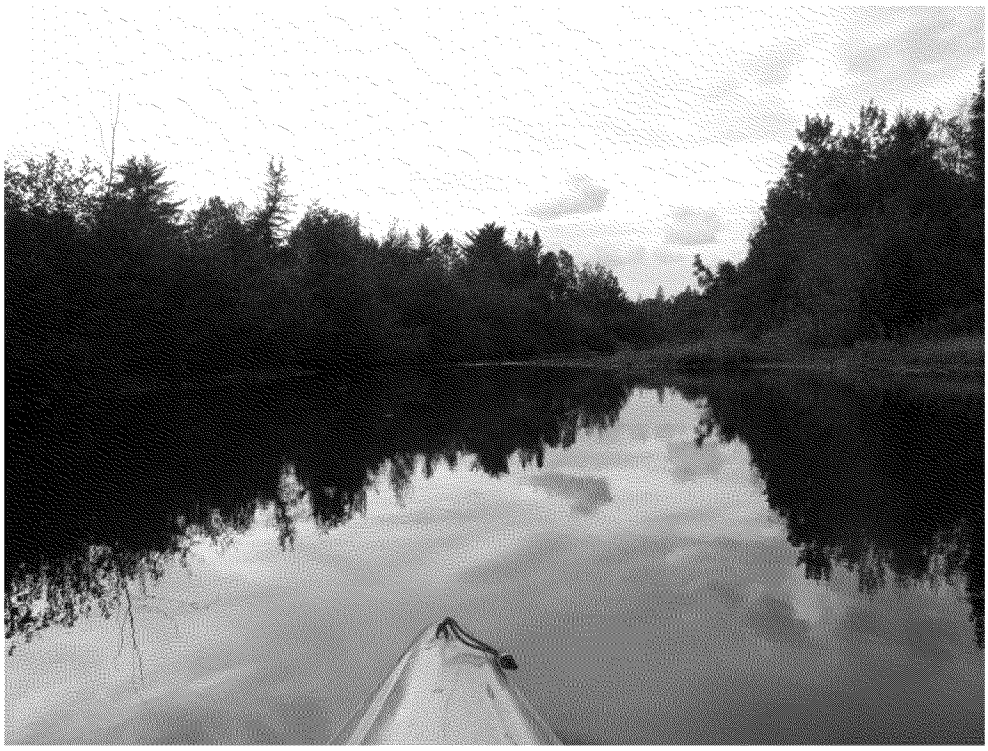
Unnamed Creek, 8/22/2011, between Mile 1.0 and 1.5 – no wild rice

Unnamed Creek, 8/22/2011, north of Mile 1.5 – no wild rice

Flamingo Creek, 8/22/2011, looking north from Mile 0.0 – no wild rice

Flamingo Creek, 8/22/2011, looking south just past Mile 0.5 – no wild rice

Dunka River, 8/30/2011, upstream from culverts at Mile 0.5 – no wild rice



Dunka River, 8/30/2011, downstream from culverts at Mile 0.5 – no wild rice